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REMARKS

In the Final Office Action, the Examiner again rejected claims 1-6 pursuant to 35 U.S.C. §102(b) as anticipated by Wright et al. (U.S. Patent No. 6,029,116). Claims 7, 9, 11-15, and 22-25 were again rejected pursuant to 35 U.S.C. § 103(a) as unpatentable over Wright et al. Claims 8, 10 and 16-21 were again rejected pursuant to 35 U.S.C. §103(a) as being unpatentable over Wright et al. in view of Breimesser et al. (U.S. Patent No. 5,622,177). Applicant respectfully requests reconsideration of the rejections of claims 1-7 and 9-25, including independent claims 1, 9, 16 and 22. New arguments are provided in italics.

In general, Wright et al. disclose an overall system, but do not provide any specifics regarding a transducer assembly or the related detachable connector components. Wright et al. disclose embodiments directed to system side, not transducer assembly, processing. To further support this distinction, a declaration from Ismayil Guracas is provided. Ismayil is an employee of the owner of the current application and Wright et al. Ismayil worked on the design of the Sequoia system of Acuson. Wright et al. disclose embodiments directed to the Sequoia system. As noted in the declaration, a person of ordinary skill would understand a transducer assembly as including a transducer, cable, and detachable connector. The disclosure of Wright et al. would have been understood, and in fact, was directed to system side circuits not in a transducer assembly.

Independent claim 1 recites processing signals and converting the processed signals within a transducer assembly. Wright et al. do not disclose these limitations. The circuits of Wright et al. are part of the ultrasound system (col. 7, lines 28-25). A transducer connector T-110 connects the circuits to the transducer arrays T-112 (col. 8, lines 5-11). The transducer arrays are interchangeable (col. 8, lines 16-22). Figure 2a shows only transducer elements T-114 in the transducer array T-112. Wright et al. use interchangeable transducers that connect at a connector to the circuits of the imaging system, so do not suggest processing and converting within a transducer assembly.

In response, the Examiner cites to col. 6, lines 48-55 of Wright et al. This disclosure provides a transmit beamformer T-50, a transducer array T-52 of elements T-54, and body tissue T-56. A transducer assembly, as known in the art, includes a transducer, cable, and connector. The transmit beamformer T-50 sends signals to the transducer T-52. The transducer converts electrical signals into acoustic signals. The transducer T-52 does not process signals and then convert the processed signals. The transducer does not process signals, but instead merely transduces. Wright et al. do not provide for processing signals in the transducer assembly.

The transmit beamformer T-50 generates signals. The transmit beamformer is not part of the transducer assembly. A transducer assembly has a known meaning. There is no disclosure in Wright et al. suggesting the transmit beamformer is part of the transducer assembly rather than the imaging system. Given the ordinary meaning, the transmit and receive beamformers are not part of a transducer assembly. Wright et al. do not process signals in the transducer assembly as claimed in claim 1.

Independent claim 9 recites a transducer assembly with a connector housing where the connector housing includes a detachable connector and a signal processing device. As noted above for claim 1, Wright et al. disclose a connector on the imaging system and interchangeable transducers. The circuitry is all on the imaging system side of the connector T-110. Wright et al. do not suggest a signal processing device in the connector housing of the transducer assembly.

In response, the Examiner cites to the abstract of Wright et al. The cited portion of the abstract notes the multi-beam processor for post beamformation adjustments to pre-detection samples from a receive beamformer. As noted above, the ordinary meaning of a transducer does not include a receive beamformer. The connector of a transducer assembly connects with a system. The system includes the receive beamformer and following circuits (multi-beam processor and detector). Wright et al. do not process in the transducer assembly. Wright et al. do not have a processing device in the connector housing of a transducer assembly. Wright et al. do not even disclose the components of a transducer assembly.

Independent claim 22 recites processing in a transducer housing. As discussed above, Wright et al. do not suggest this limitation. Claim 22 also recites further processing within a detachable connector. Wright et al. process in the imaging system on the other side of the connector T-110, not within a detachable connector.

In response, the Examiner cites to the abstract of Wright et al. A front-end control C-134 sets switches of a demux T-106 and mux R-108, interfaces with transducer connectors T-110, and sets gain and bias levels of amplifiers T-123 and R-116. First, the connectors T-110 are not disclosed as including devices for processing. Second, the connectors T-110 are clearly the system side connectors, so are not detachable like transducer assembly connectors. Wright et al. show circuits in the imaging system connected with the connectors T-110, but do not show detachable connectors. Whether detachable or not, no processing is shown in a connector.

Dependent claims 2-7, 10-15, and 24-25 depend from one of the independent claims discussed above, so are allowable for the same reasons. Further limitations distinguish from Wright et al.

Claim 4 recites partially beamforming demultiplexed signals. Wright et al. use a multiplexer to connect the beamformer to different element channels, but does not partially beamform demultiplexed signals. T-106 is used for transmit. Claims 14 and 25 are allowable for similar reasons.

Claim 6 recites mixing signals from a plurality of elements. Apodization is weighting individual signals with a multiplier, not mixing signals from a plurality of elements. Claim 12 is allowable for similar reasons.

Claim 7 is allowable for the same reasons as claim 22.

Claim 10 is allowable since a person of ordinary skill in the art would not have used the channel reduction of Breimesser et al. with the beamformer of Wright et al. Breimesser et al. teach the line reduction being useful for 2D arrays instead of 1D arrays (col. 1, lines 40-47). However, Wright et al. use 1D arrays (col. 8, lines 16-20). Wright et al. also desire interchangeable arrays (col. 8, lines 16-31), so provide the circuits in the imaging system (col. 4, line 56; col. 6, lines 35-39; and col. 7, lines 27-35). Breimesser et al. position circuits

the transducer in a 3D imaging system. A person of ordinary skill would not have used electronics in the transducer of Breimesser et al. since it would have resulted in expensive and needed circuits in the transducer, reducing interchangeability.

Claim 1 is allowable for similar reasons as claim 10.

Independent claim 16 is allowable for the same reasons as claim 10 – a person of ordinary skill in the art would not have used the teachings of Breimesser et al. with Wright et al.

Independent claim 16 is allowable for another reason, the cited reference both fail to disclose converting partially beamformed signals to a different form for the ultrasound system, the conversion being performed in the transducer assembly. Wright et al. provide all the circuits in the ultrasound system as noted above. Breimesser et al. provide for multiplexing signals from elements in the transducer probe, but with demultiplexing in the ultrasound system (col. 4, lines 60 – col. 5, line 25). Multiplexing allows selection of elements for an aperture. Multiplexing does not provide for beamforming in the transducer assembly. Multiplexing does not convert signals to a different form. Breimesser et al. do not convert beamformed signals.

Dependent claims 17-21 depend from claim 16, so are allowable for the same reasons. Further limitations distinguish from the cited references.

Figure 17 recites sub-array mixing. Neither reference suggests this limitation. Wright et al. mix signals for down conversion, but do not sub-array mix.

Claim 18 recites demultiplexing in a connector housing. Breimesser et al. demultiplex in the ultrasound system. Claim 18 recites demultiplexing partially beamformed signals. Breimesser, et al. demultiplex individual element signals.

Claim 19 recites converting and outputting in a connector housing, so is allowable for the same reasons as claim 9.

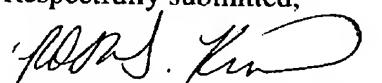
CONCLUSION:

Applicant respectfully submits that all of the pending claims are in condition for allowance and seeks early allowance thereof. If for any reason, the Examiner is unable to allow the application but believes that an interview would be helpful to resolve any issues, he is respectfully requested to call the undersigned at (650) 943-5330 or Craig Summerfield at (312) 321-4726.

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